NOTES ON THE OCCURRENCE OF SAUROPOD REMAINS FROM N. KWEICHOW, CHINA.

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(*With two text figures*)

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INTRODUCTION

In 1944, Dr. T. H. Yin and Mr. I. W. Shen of the Geological Survey of China discovered an interesting locality with vertebrate remains. It lies about 300 meters NN.W. from the military post at Chingkangsao(1) near a local town called Sungkan(2), 43 km from the northern gate of Tungtze Hsien(3) right along the Chungking-Kweiyang High Way. The main part of the collection consists of one well preserved dorsal vertebra, part of a sacrum, distal end of a left pubis and about ten isolated pieces of ribs and fragments of undeterminable bones, belonging apparently to one individual. Dr. Yin had immediately realized the significance of the discovery, but was unfortunately unable to make further excavation for lack of time. The well preserved condition of the vertebra and even the partial connection of the ribs suggest that the entire skeleton should be expected there though only a few bones were brought to the laboratory. Nevertheless, it seems to be of interest to give a short account of this find, as Sauropod locality is rarely known in S. China. Cat. No. V361.

DESCRIPTION OF THE DORSAL VERTEBRA.

The best preserved piece is the dorsal vertebra with the centrum, the spina dorsalis and both diapophyses in tolerable condition. It is slightly distorted without, however, the essential features of the vertebra much concealed. Although it is undoubtedly a Sauropod vertebra, as shown by the shape of the centrum, the massiveness of the neural arch and the dorsal spine as well as the huge size, the present specimen displays a series of perculiar characteristics which distinguish remarkably from other sauropods. They are: (1) The strange development of the dorsal spine with the apparent disappearence of the supraprezygapophysial lamina, suprapostzygapophysial lamina and the supradiapophysial lamina. The whole spine forms a long single anteriarly convex and posteriorly trough-like concaved blade. (2) The relative low position of the diapophyses which are almost immediately above the neural canal. There is no constrictional part at the sides of the

(1) 青杠哨 (2) 松坎 (3) 桐梓縣

neural arch between the centrum and the diapophyses. (3) There is no trace of parapophyses, even the prezygapophyses and the postzygapophyses seem to be poorly developed, if not totally wanting. All the laminae between the level of diapophyses are reduced or simplified. And (4) the centrum has a weakly concaved anterior end and a deeply concaved posterior end. The pleuro-central cavity is lowly situated.

As supplementary features it might be described as follows:

The *centrum* possesses a median longitudinal ridge (a feature seems to be also perculiar in the present form). It is anteriorly very strong and vanishes posteriorly about the middle point of the centrum. The pleurocoel cavity is located quite near the anterior end and widely apart from the upper border of the centrum. At the anterior border of the pleuro-central cavity, there develops a protuberance directing posteriorly and overhanging the anterior part of the pleuro-central cavity, a feature also not observed in other

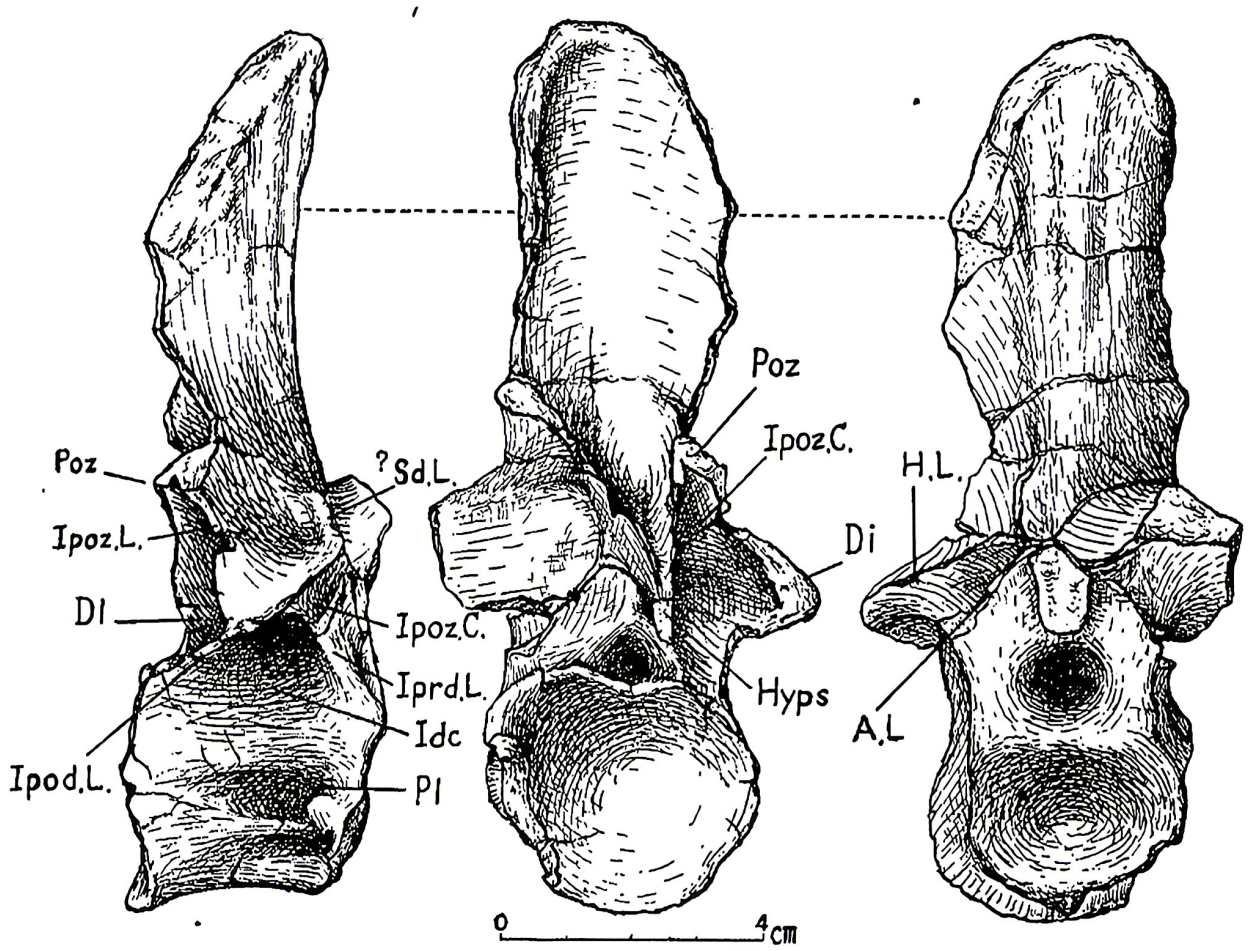

Fig. 1. Sauropoda gen. et sp. indet. A posterior dorsal vertebra in right side, posterior and anterior aspects. 1/6 nat. size. A.L., accessory lamina (probably infraprezygapophysial lamina); Di., Diapophysis; H.L., Horizontal lamina; Hyps, Hyposphen; Idc, C., Infradiapophysial cavity; Iprd.L., Infraprediapophysial lamina; Ipod.L., Infrapostdiapophysial lamina; Ipoz.C.; Infrapostzygapophysial cavity; Iprz.C., Infraprezygapophysial cavity; Pl., Pleurocoel; Poz., Postzygapophysis; Sd.L., Supradiapophysial lamina.

Sauropods. Although the anterior end is concave, the vertebra should be considered still as opisthocoelus, as the upper border below the neural canal is weakly elevated and forms a transversal bar, separating the neural arch and the main centrum. The posterior end is deeply concave. In both ends, the transversal breadth exceeds slightly the height.

At the sides of the *neural arch,* the part bordering the neural canal is heavily built, almost as so wide as the maximum breadth of the centrum. The neural canal is well rounded, about 40 mm in width. In lateral view, the diapophysis is supported by the infraprediapophysial lamina and the infrapostdiapophysial lamina and thus forms a large infradiapophysial cavity. There seems no trace of other laminae other than those mentioned ones. In posterior view, the lower medial ridge of the postzygapophysis extends downwards very low. That of both sides meet at very short distance above the neural canal. This may indicate the position of hyposphen and is dislocated and damaged.

The *diapophyses* is short and situated about 90 mm above the upper border of the centrum (measured from the less dislocated right side). The tip of the left one is broken and somewhat shifted by pressure. It looks also much bigger than the right one which is intact. The tip of this one is pointed, no well formed facet, it represents practically the meeting point of the infraprediapophysial, infrapostdiapophysial and the anterior and posterior horizontal laminae. The latter ones are in fact not "horizontal". The anterior one runs slightly upwards and disappears near the median front of the base of the spina dorsalis where the prezygapophysis should be located. The posterior one directs almost vertically to meet the highly situated postzygapophysis which is broken. It may thus, indicate the infrapostzygapophysial lamina. In anterior view, between the anterior horizontal lamina and the region of the neural canal, there is a faint low but distinct ridge, almost perpendicular to the infraprediapophysial lamina (marked in the accapanying sketch as A.L.) may be considered as the infraprezygapophysial lamina. This is, however, less distinct in the left side. At the upper end of the horizontal lamina, there is a short but prominent ridge which may corresponding to the supradiapophysial lamina. There is a depressed area between the two laminae. Both features are not clearly observed on the left side. At the median part, short above the neural canal, there is a flat broken area. When undamaged, it should represent a convexed part, a feature which is also unusual in Sauropods. This part is markedly concave in most Sauropods, excepting in the first dorsal vertebra, f.i. in *Apatosaurus louisae* (Gilmore, 1936, Plate 25, 1, A.)

The most strange feature of the specimen is the construction of the *dorsal spine.* Its length exceeds considerably the remaining part below the diapophysis (about two-third of the whole height of the entire vertebra). It directs almost straight vertically. Looking from the side, the anterior border forms a neat curvature with the top bends slight anteriorly. The

convexed anterior surface is not smooth but ornamented by faint and low striations. The most distinct median ridge, starts from the middle point between the diapophyses, narrow, high, and runs up to the tip of the spine. It becomes gradually broader as approaching the maximum width near the top. On each side, laterally, there is a fainter ridge, starting to branch off from the median ridge at the base of the spine and runs also up to the top in a reduced manner of broadening. On the right side there is still an accessory ridge, branching off from the lateral one at the middle part of the spine. The top of the spine is not notched nor truncated but forms an anticlinal outline. In this part the spine is much thicker than the remaining portion. In posterior view, the spine is entirely convave and hollow. The lower borders converge medially and downwards in order to meet each other at the point short above the neural canal. The lower part of this border seems to represent the median border of the huge infrapostzygapophysial cavity. The lower part of both borders is much damaged but it seems that the thicker part with a ridge branching off from the lateral border (Ipoz. L.) should represent the root of the postzygapophysis. The convaved posterior side of the spine is, on the whole, smooth and no trace of any ornamentation excepting with a few faint tuberculated part, apparently for attachment of muscles.

Determination and Discussion.

Based on the above described characteristics of the specimen, I failed to find a close form which is comparable in precise manner. Yet, by the massiveness of the vertebra, it seems no doubt to consider it as a member of Sauropods. Judging the weak opisthocoelus character of the centrum and the anterior position of the pleuro-central cavity, the shortness of the diapophyses as well as the poor development or disappearence of some laminae, the vertebra must represent very posterior part of the dorsal column, saying the last one or the one before the last. The vertebra may not bear ribs at all.

On the other hand, there are many characteristics as described above, are so perculiar that we may think that it may not be a Sauropod at all. The strange construction of the dorsal spine is the most striking feature which distingushes from all known Sauropods. It must be noted, however, that the posterior vertebrae of *Camarasaurus supremus* show somewhat concavity in the posterior side of the dorsal spine (Osborn and Mook, 1921, Plate LXX.) Assuming that all the laminae along the spine are considerably reduced, our specimen would show a cross-section of the spine derivable from that given by Osborn and Mook in the test figure 39.

The size (See measurements below) of the vertebra is comparable with the known Chinese Sauropods (*Helopus, Tienshanosaurus* and *Omeisaurus*). Unfortunately, in none of them the presacral dorsal vertebrae are adequately known. As the inflated feature of the spine must be traceable in the

preceeding vertebrae and there is no indication of such in any of the cited genera, we think it is quite unlikely that we may refer our specimen to any of these forms.

The present specimen is nearly one-half smaller than *Apatosaurus louisae* and also much smaller than other Sauropods (f.i., *Canarasaurus, Brachiosaurus,* etc. . . .). The posterior dorsal vertebrae of *Apatosaurus louisae* show a rather flat appearence in the anterior end of the centrum, low position of the diapophyses and even the dorsal spine of the dorsal vertebra no. nine shows broader and thicker tip, (but not anticlinal), but the prominent anterior and posterior as well as the lateral ridges preventing any further comparison.

It is thehrefore very probably that we have to do with a new peculiar Sauropod. But the material on hand seem not sufficient to erect a new name, at least at present. The present collection thus suggests that the Sungkan locality may turn out to be a good field for hunting of Dinosaurs.

Notes on Some Other Associated Bones.

Besides the described vertebra, there are only two bones worth-mentioning among the other fragments of ribs and undeterminable bones.

The first one is part of sacrum with two co-ossified sacral vertebrae, as seen clearly from the ventral view. Unfortunately, both are not complete for given the exact length. On both lateral sides, part of the sacricostal yoke is preserved. But the bone is so badly distorted that we are even not possible to judge which end has to be directed anteriorly.

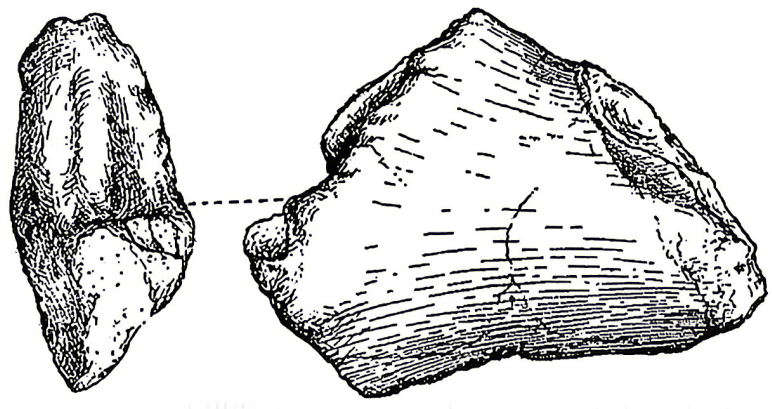

Fig. 2. ?Distal part of a left pubis in lateral and distal aspects. 1/6 nat. Size.

The second specimen is still obscure. It is probably a distal end of a pubis. Some distance above the distal end, there is an oblique breakage. The preserved part possesses one rather flat and one convez side. The distal end shows two facets separated by a sharp angle. The short one seems to represent the articulated part with the other pubis. The longer one has a median groove developed. In both facets, the bony surface is marked

by tuberculated rough surface. This bone seems to represent the distal part of the left pubis. In the pubis of *Apatosaurus* and *Camarasaurus,* the distal of the pubis forms an obtuse angle, while in the present specimen, the angle is about 90 degrees.

MEASUREMENTS (in milimeters)

Vertebra.	Cat. No. V 361	Post. Dor. ver. of *Helopus*, No. XXVII	Dor. ver. of *Omeisaurus*	Dor. ver. of *Tienshanosaurus*	Dor. vor. of *Apatosaurus* 3018	Dor. ver. of *Camarasaurus* Pl. LXX, No. 10
Greatest length of the centrum	150	124	120	120	225	190
Greatest diameter of the centrum (posterior end)	170	105	195	160	315	380*
Greatest height of vertebra above the middle of the inferior border	545	——	——	370	1350	900

?*Pubis.*

Greatest breadth of the distal end 240
Greatest transversal breadth 100

CONCLUSSIONS.

Although the present vertebra is peculiarly constructed, it is obviously a sauropod. The size is comparable with the known Sauropods in China, but all of them bear no such inflated dorsal spine. Disregarding the sharply developed various laminae along the spine in *Camarasaurus,* our specimen shows a little resemblance to the American form. The finding of such vertebra may indicate that a new Sauropoda is to be expected in the southern border of the Szechuan Red Basin.

According to Dr. Yin, this specimen has been found from the basal part of the Cretaceous Beds, lying about 150 meters above the contact with the Jurassic Beds. In association with the Sauropod remains, Dr. Yin has found and described a corprolite of fish. It is difficult to draw a definite conclusion regarding the age of the beds based meerly on such imperfectedly known specimens. But as most of the Sauropods here cited and comparable with belong to Upper Jurassic rather than Lower Cretaceous, the age problem is obviously of profound interest.

* Measured from Plate LXXV 10, C in Osborn and Mook, 1921.

The Sungkan Dinosaur tentatively attributed to Juro-Cretaceous age represents the first find of its kind to the south of the Yangtze River. It is, therefore, particularly interesting from the point of view of geographical distribution in addition to the palaeontological peculiarities already set forth.

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MATURATION IMPARFAITE IN VITRO SUR LES OEUFS INTRA-OVARIENS DE CRAPAUD (BUFO BUFO ASIATICUS)

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Chez les Batraciens comme chez tous les autres Vertébrés, la maturation ne se débute qu'au moment où l'oeuf est prêt de se libérer de l'ovaire et va passer dans la cavité générale maternelle. Jamais on n'a vu *dans la nature qu'elle s'accompli sur l'oeuf intra-ovarien.*

Cette impossibilité de la maturation intra-ovarien ne s'expliquera-t-elle par l'existance à l'extérieur de l'ovocyte des revêtements membraneux qui auraient fait obstacle à sa manifestation?

Il nous semble que non! Car, il est *déjà démontré,* par nous même, que l'oeuf *extrait de l'ovaire par des pinces,* ne se mûrira jamais, ni *dans la solution physiologique,* ni même quand il est introduit dans *la cavité générale d'une femelle injectée* préalablement par *l'hormone pituitaire* ou sans injection.

Toujours guidé par la théorie osmotique dûe à mon maître prof. E. Bataillon, théorie reconnue lumineuse dans la parthénogénèse, nous nous avons donc attaqué le problème de la maturation *in vitro* sur les *oeufs*